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ABSTRACT

The paper reports findings from evaluations of 262 children (3 to 15 years old) with suspected perceptual motor dysfunction. In the first section, a clinical perspective of the history and perceptual-motor functioning of the learning disabled Ss is presented. Section II concentrates on discriminate function of a screening procedure to differentiate between perceptual-motor dysfunction and retardation in learning disabled children. A final section provides a brief overview of educational and therapeutic implications for using screening and intensive clinical evaluation procedures with learning disabled children. (Author/SBH)

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SENSORY-PERCEPTUAL-MOTOR DYSFUNCTION OF LEARNING DISABLED CHILDREN

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Introduction

In 1970 the Perceptual-Motor Clinic was established at the University of Kansas for the purpose of evaluating children with suspected perceptual motor dysfunction and for providing remediation to those youngsters found to have severe problems. Since 1970, we have gathered complete family, medical, educational, and visual histories, plus a variety of perceptual-motor data on all children evaluated. These data were quantified and computer analyzed to provide greater insight into the developmental profiles of learning disabled children. Our purpose here at the First World Congress is to report findings on 262 subjects tested during the eight year study.

Our presentation is divided into three sections. During the first section we will present a clinical perspective of the history and perceptual-motor functioning of our learning disabled subjects; the second portion will be a report of discriminate function of a screening procedure to identify between perceptual-motor dysfunction and retardation in learning disabled children; and we will conclude with a brief overview of educational and therapeutic

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implications for using screening and intensive clinical evaluation procedures with learning disabled children.

Clinical Perspective of the History and Perceptual-Motor Functioning of Learning Disabled Children

Children are referred to the Perceptual-Motor Clinic by a variety of specialists or by parents who are curious about their children's development. The 262 subjects included in this study ranged in age from 42 to 185 months ($\bar{x}$ = 100). There were 196 males and 66 females in the group. Eighty-seven percent of the subjects included in our study demonstrated IQ scores above 85 as measured by the Stanford Binet.

Demographic Information:

One hundred seventy-three were caucasian; the remaining 89 represented a variety of ethnic groups.

Family location: 195 resided in urban communities of 25,000 to 49,999 population; the remaining came from rural farming communities of under 2,500 in population to large urban communities over 100,000 in population.

Family makeup: 45% of the children were first born; 31% were second born. Two hundred four children came from families where their natural parents headed the household, 20 children were adopted, and the remaining were foster children or lived in families with one parent and/or a step-parent.

Family status: 79% of the children's fathers were employed as professional, semi-professional, clerical or skilled manual workers; 21% came from families headed by fathers who were semi-skilled, unskilled, farmers, retired or a student. 73% of the families

had incomes which placed them into middle to upper social class status; 27% were classified as having below middle class income.

Pre-Peri-Post-Natal Histories

Pre-natal care was begun by the 4th month of pregnancy in 96% of the cases; 85% of the mothers reported no illnesses during pregnancy; 80% of the mothers abstained from drugs and medication during the pregnancy.

Pre-natal history - out of 202 mothers reporting, 69% experienced no difficulty during a labor of normal duration; as to type of anesthesia used during the delivery, 47% were given a general and 37% received a local anesthesia. Term of pregnancy: 84% were full term babies, 13% were premature and 3% were post mature. There were no delivery complications in 85% of the cases, 6% were caesarean deliveries, 5% were breech births, and the other 3% were transverse lie or had the unbilical cord around their necks. Size of the child: 50% were 50 cm or shorter at birth; 23% were under 1000 gm, 40% ranged in weight from 3100-3500 gm, and 37% were over 3500 gm at birth.

Post-natal histories - 90% of the children were reported as having begun to sit without support, crawl, walk and speak well within normal limits. 74% of the children had no known allergies, whereas, 26% had single or multiple food and/or environmental allergies.

Dominance - 81% of the children were right handed, 17% were left handed and 2% were ambidexterous. Right eye dominance was demonstrated by 67% of the subjects, and 30% demonstrated left eye dominance.

Perceptual-Motor Tests

A battery of perceptual-motor tests was individually administered to each child tested in the clinic. Included in this battery were the Lincoln-Oseretsky

Motor Development Scale, Purdue Perceptual-Motor Survey, Frostig's Developmental Visual Perception Test, Fiorentino's Reflex Test and other selected items. Half of the tests were administered on one day; the other half were administered before one week had elapsed.

Almost half of the subjects demonstrated seven or more abnormal reflex patterns. Such reflex abnormalities are known to interfer with movement stability and may have an adverse effect on perceptual development. Studies reported in the United States by Guftason, Rider and Werbal indicate that young children who demonstrate more than three abnormal reflexes experience reading difficulties and/or behavior problems in the classroom.

Of the 262 subjects tested, 70% scored below 60 points on the Purdue Perceptual Motor Survey. A study completed by Werbal (1975) demonstrated statistical significance between seven or more abnormal reflex patterns and depressed posture and balance and body image subtest scores on the Purdue Survey; therefore, the low total Purdue scores our subjects demonstrated could be expected in light of the unusually high number of abnormal reflexes found.

Whereas a review of the total Frostig scores does not appear unusual, a more sophisticated statistical analysis was more enlightening.

Discriminate Function of a Screening Procedure To Identify Between Perceptual-Motor Dysfunction and Retardation In Learning Disabled Children

The purpose of this investigation was to determine the degree of relationship among measures of perceptual-motor functioning comparing three group

of diagnostically different children with learning disabilities referred to a perceptual-motor clinic. The population characteristics and instrumentation have been described previously. An intercorrelation matrix was developed among 276 test scores. Four principle component factor analyses were conducted from which rotated varimax loadings were obtained for: (1) total clinical group (n=253); (2) clinically normal group (n=26); (3) perceptual-motor dysfunction group (n=210); (4) perceptual-motor retardation group (n=17).

The results of the factor analysis, using the 276 variables obtained of the total clinical group yielded 30 factors which generated an eigenvalue of $\geq$ 1.0. These 30 factors accounted for 73.5 percent of the group variance. All variables with factor loading = $\geq$ 0.50 were considered as factor descriptors. The factor analysis of the clinically normal group yielded 21 factors which generated an eigenvalue of $\geq$ 1.0. These 21 factors accounted for 96.7 percent of the group variance. The same factor loading criterion as was used for the total group was used to identify factor descriptors for the normal group. The data yielded 30 factors using the same eigenvalue criterion stated above when the factor analysis procedure was applied to the perceptual-motor dysfunction group. These 30 factors accounted for 75 percent of the group variance. All test variables meeting the $\geq$ 0.50 criterion were identified as factor descriptors. In the perceptual-motor dysfunction group, only 21 of the 30 factors contained factor descriptors meeting the $\geq$ 0.50 criterion. These 21 factors accounted for approximately 75 percent of the group variance. Thus, the elimination of the 9 factors did not grossly affect the explained variance of the group. The factor analysis of the perceptual-motor retardation group data yielded 16 factors which met the eigenvalue criterion of $\geq$ 1.0. These 16 factors accounted for 100 percent of the group variance. Only 15 of the 16 factors contained

variables with loadings = $\geq$ 0.50 to be considered as factor descriptors. The 16 factors accounted for 98.6 percent of this group's variance. Caution must be given when considering the factors identified in the clinically normal group and especially in the perceptual-motor retardation group because of the small number of subjects and the number of factors identified approach the theoretical ceiling when the factor analysis procedure was used.

A second question studied was, can one identify a discriminate function for each group to differentiate among them for screening purposes?

Because of the procedural concerns when applying a factor analysis procedure in analyzing the data of two clinical groups, 25 were identified which accounted for approximately two-thirds of the variance for the total clinic population, e.g., r = .68, as determined by using a cluster analysis procedure on the 276 variables under investigation. An analysis of variance was then applied to the data. Overall F tests were found to be significant on 20 of the 25 variables. All 20 variables were then analyzed for multiple comparisons using the post-hoc Scheffé procedure. On 7 of the 20 variables a significant difference was found between each of the three groups. Significance was attributed only to the clinically normal group on 6 of the 20 variables. On 4 of the 20 variables no post hoc differences were found among the 3 clinical groups. Finally, on 3 of the 20 variables the clinically normal group scored significantly (.01) higher than the perceptual-motor group, but no differences were found between the normal and retarded group nor between the dysfunctionate and retarded groups.

Using the seven variables that significantly differentiated among the three groups, a discriminate function was obtained to discriminate groups of learning disabled children among the three clinical entities. It was found that 2 of the 7 variables, L-O touching nose-eyes closed and L-O catching a

ball right hand, can be used to predict the group membership of the children evaluated at the perceptual-motor clinic.

TABLE 1.

Discriminate Functions to Use in Predicting
Clinical Group Membership in a Perceptual-Motor Clinic

Perceptual-Motor Group	Discriminate Function Equation
Clinically Normal	2.56 x(L-O #4 score) + 0.55 x(L-O #12 score) - 5.69
Dysfunction	2.48 x(L-O #4 score) + 0.12 x(L-O #12 score) - 4.28
Retardation	1.91 x(L-O #4 score) + 0.07 x(L-O #12 score) - 2.95

Conclusion

Using the discriminate function equations of Table 1, perceptual-motor diagnosticians/trainers may now assign learning disabled children with suspected associated perceptual-motor problems to one of the three diagnostic groups using the two essential measures of perceptual-motor functioning.

Educational and Therapeutic Implications For Using Screening and Intensive Clinical Evaluation Procedures With Learning Disabled Children

In light of the strength of statistical differentiation between the throwing and nose touching tasks; it seems practical to use these items as screening tests to discriminate between learning disability children with normal, dysfunctionate and retarded perceptual-motor development; however, the items do little to suggest specific areas of developmental difficulty that need remediation.

A review of the variables included in the perceptual-motor components of the three groups clearly indicates that "packaged" perceptual-motor tests and remediation programs that focus on limited aspects of development cannot begin to resolve the variety of problems children demonstrate. There are data that indicate that if specific perceptual-motor lags are pinpointed and therapeutic activities are developmentally sequenced, perceptual-motor problems of learning disabled children can be eliminated.

In a study we completed in 1977, tests administered one year after children who had originally demonstrated severe perceptual-motor dysfunction were released from clinic indicated statistically significant (.05 to .01) improvement had been maintained for reflex development, all Purdue and Frostig subtests, and most Lincoln-Oseretsky items. That is, after children with depressed perceptual-motor development had received individually designed therapeutic programs that were developmentally sequenced and applied on a one to one basis by trained therapists, they demonstrated normal perceptual-motor development and maintained their gains.

The therapeutic programs were based on information obtained from extensive perceptual-motor tests we use. The screening items were introduced to you during this presentation cannot provide the indepth diagnosis that a large battery can; however, they should prove useful in separating children with normal development from those with dysfunctionate or retarded perceptual-motor profiles.